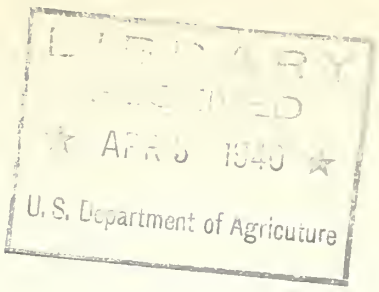

Legume Coverage Studies in Alabama

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The effectiveness of winter legumes as soil building crops has been evaluated at the experiment stations throughout the South. All have found them to be excellent sources of nitrogen. The Alabama Agricultural Experiment Station reports that the average yield over a period of years of cotton following winter legumes is increased about 600 pounds per acre and the yield of corn about 16 bushels per acre over check areas receiving no nitrogen. These average increases are slightly greater than was obtained when the equivalent nitrogen was supplied in a commercial fertilizer. The increase over that obtained with commercial nitrogen was especially noticeable where the legume crops could adapt themselves to soils of low fertility, since they not only supplied the needed nitrogen but apparently furnished organic matter as well. It has been found also that the turned legumes have a marked residual effect, probably due in part to the added organic matter and in part to a change in soil structure.

The increase in growth of the use of winter legumes in the Southeast as soil-building crops has been phenomenal. Farmers grasped at the chance to conserve and build up their soils but were for the most part limited in the acreage by the amount they could turn satisfactorily during the short period between the time that the legume crop had enough growth to furnish the needed nitrogen and the latest date the seedbed could be prepared for the crop to follow, especially if the crop was cotton. The farmers using only one or two light mules

are especially handicapped since their small plows, 10-inch or smaller, are inadequate. They fail to cover or kill a heavy growth of the legume. In spite of this, the pounds of winter legume seed planted in Alabama increased from 1,535 in 1918 to 1,127,096 in 1928 and to 15,673,602 in 1938 (figure 1). The amount remained static at about 5,000,000 pounds from 1932 to 1935 but the Agricultural Conservation Program gave it new impetus; this explains the marked increase since 1935.

Studies to determine the possibilities of covering legume crops with moldboard plows were carried on from 1923 to 1927 by the Alabama Agricultural Experiment Station. The results of these studies showed the value of proper adjustment of the plow and certain attachments for getting the debris turned. However, farmers were soon planting more acres than they could handle with their moldboard plows, so those having the necessary power available resorted to using the following tools: standard disk plows, vertical disk plows, disk harrows, and middle bursters. The method used depended on the power and equipment available. Their problem was to get the legume under or incorporated into the soil so that it would rot before the cash or feed crop was planted so as to reduce the hazard from certain insects and the possibility of the seed or young plants being killed by heating in the early stages of decay. The plan used by many farmers was to get over the acreage as quickly as possible; then if the kill was not sufficiently complete, to go over parts of it again. These haphazard, and many times inadequate, methods often gave disappointing results due to competition of the legume with the cash crop, changed soil structure

and the necessity of planting the cash crop late.

The outgrowth of this uncertainty was a demand for some type of equipment and method of use that would turn the legume crop satisfactorily in a once-over operation and have a minimum of draft. As a first step, a study was conducted cooperatively between the Alabama Agricultural Experiment Station, the Bureau of Agricultural Chemistry and Engineering, and representatives of a number of implement companies during the fall of 1935 in a heavy growth of velvet beans on one of the McQueen Smith Farms. The results obtained were only indicative, since the growth was much ranker than would be encountered with soil-building crops. They did show, however, that the job could be done with disk equipment and that the units throwing the soil one way had an advantage over the conventional tandem disk harrow because they did not tend to ridge the land.

Selected methods of turning winter legumes (hairy vetch) were studied on the McQueen Smith Farm in 1936, 1937, and 1938 and on the Morris Plantation near Shorter, Alabama, in 1939. The equipment used, depth and speed of operation, and yields of the crop that followed are shown in Table I and graphically in figure 2. No dragging or disking was done prior to bedding. The equipment used and the type of work done are shown in figures 3-6. Each of these tools and each method of operation covered or incorporated the surface debris in a characteristic manner. The large-base tractor plow equipped with colter, jointer, and wires placed all of the debris near the bottom of the furrow in a narrow strip, as shown in figures 7a and b. The mule plow equipped with a colter and one wire pulled all of the debris

under the furrow, figure 7c, but due to the lack of a jointer, did not get it as near the bottom of the furrow as the larger plow. Figure 8a, b, and c shows the work of the vertical disk plow. At the shallow depth and higher speed, the debris is mixed haphazardly through the plowed soil, but at the greater depth it is laid between the furrows with some protruding at speeds of both 2 and 4 miles per hour. Figure 9a and b shows that at the higher speed, 4 miles per hour, the standard disk plow leaves the soil quite level with most of the vetch laid between the furrows; but when cutting deep at a low speed, it leaves large voids. A large amount of vetch was left living in these voids. A comparison of the jobs done by a moldboard plow and a standard disk plow is shown in figure 10. Both were operated at about 4 miles per hour. The standard disk plow tended to throw the furrow slice with a spiraling action. This caused pieces to be thrown crosswise to the direction of travel, left many voids, and exposed a large amount of vetch. A disking operation was necessary to put this area in planting condition. The area plowed with the moldboard plow could be bedded and planted as soon as the green material had decayed sufficiently.

The data from these tests, Table I and figure 2, show that turning the cover crop with a large-base moldboard plow equipped with colter and covering wires gave the highest yield for each year. Plowing 4 inches deep produced higher yields than at 8 inches in 1936 and 1937 but the deeper work gave best results in 1938 and 1939. This is no doubt due to the fact that an excessive amount of subsoil was turned up the first two years. The plot in field No. 1 and the entire field

Table I

METHODS OF TURNING VETCH AND YIELDS OF THE CROP THAT FOLLOWS

Equipment Used	Operation and Adjustment		Yields per Acre			
			Lbs. Seed Cotton per Acre			Bushels Corn per Acre
	Depth Inches	Speed mph	1936	1937	1939	1938
Vertical Disk Plow	6	2	1282	1207	1162	30.8
Vertical Disk Plow	3½	2	1370	1276		38.0
Vertical Disk Plow	3½	4	1394	1238	1144	34.1
Standard Disk Plow	4	2	1455	1414		37.8
Standard Disk Plow	9	2	1419	1441	1160	33.3
Standard Disk Plow	4	4	1235	1412	1107	32.0
Walking Plow with Colter	4½	2½	1252	1384	1140	34.7
Tractor Plow 14"	4	3	1497	1568	1190	37.0
Tractor Plow 14"	8	3	1459	1484	1247	42.5

1936, 1937, and 1938 data from McQueen Smith Farms
1939 data from Morris' Plantation

No. 3 had been worked deep at least two seasons before the 1938 and 1939 tests. The yield for the plots plowed with mule units was below the tractor plowing each year. This must be due to the greater pulverization produced by the tractor plows.

The maximum yields for the standard disk plow was above that for the vertical disk plow each year. These data indicate that the standard disk plow is very sensitive in its operation. The yields were reduced when the speed was increased from 2 to 4 miles per hour. This characteristic is indicated for the vertical disk plow also.

In evaluating these data for a farmer's conditions, the area that can be covered in the time available becomes an important factor. If he has the power available to turn the legume with tractor plows and his soil gives no scouring troubles, it will probably be to his advantage to use the moldboard plows. However, if he is short of time or if his soil is too sticky to scour readily, it may be more economical to use disk equipment as timeliness of getting the cotton or corn crop planted may affect the yield much more than the amount shown for the method of turning.

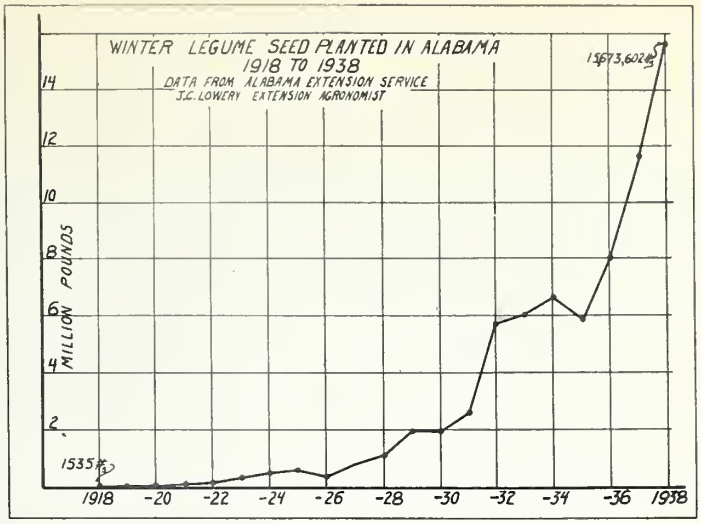


Fig. 1 The increase in quantity of winter legume seed planted in Alabama is an indication of the increasing practice of turning.

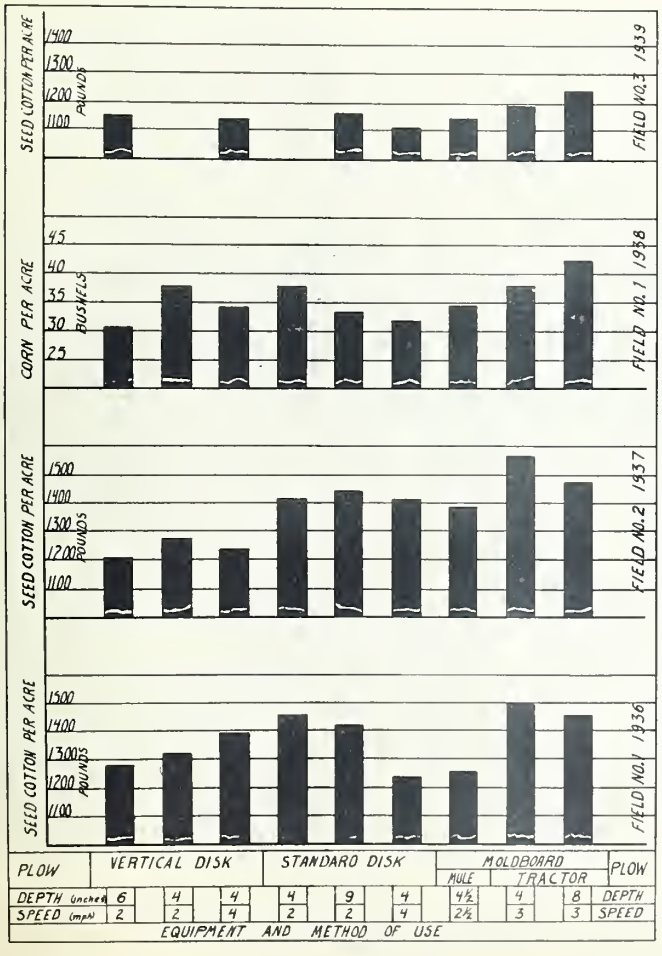


Fig. 2 The yields of corn and cotton on test plots show for each year the relative value of the several methods of turning.

Fig. 3 Vertical disk plow being operated at 4-1/2 miles per hour. The vetch was killed though not completely covered.

Fig. 4 This farmer-owned vertical disk unit is doing a good job of turning a heavy growth of vetch and cotton stalks in a sandy loam soil.

Fig. 5 Turning and covering completely a heavy growth of cotton stalks and vetch in a sandy loam soil with a tractor-drawn moldboard plow.

Fig. 6 A 10-inch walking plow equipped with a small rolling colter and one covering wire.

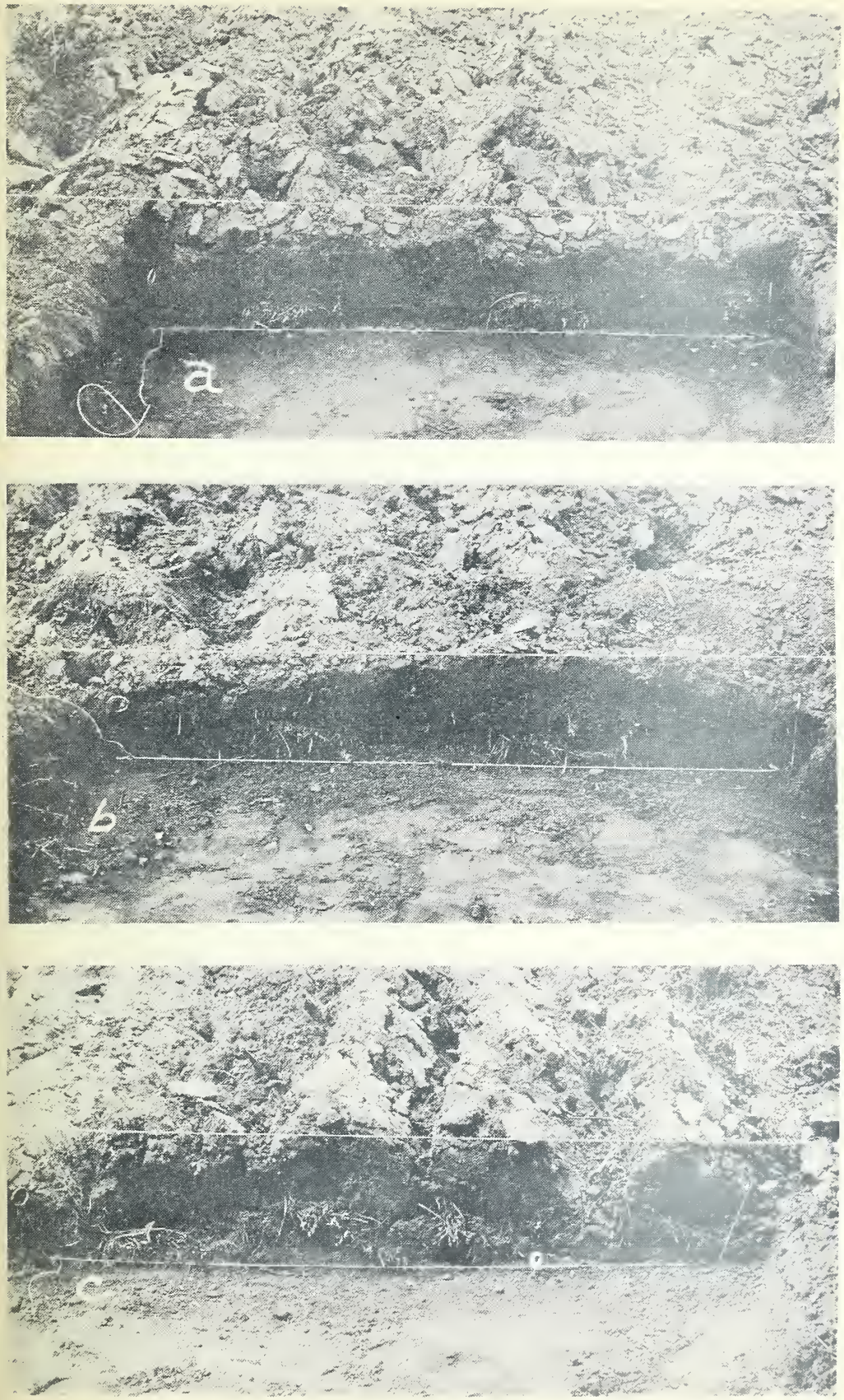
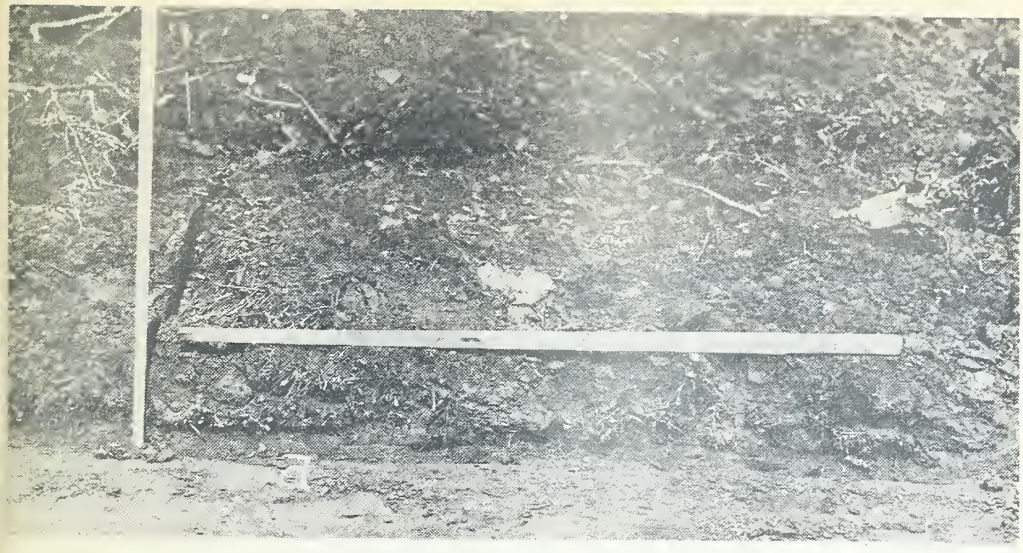
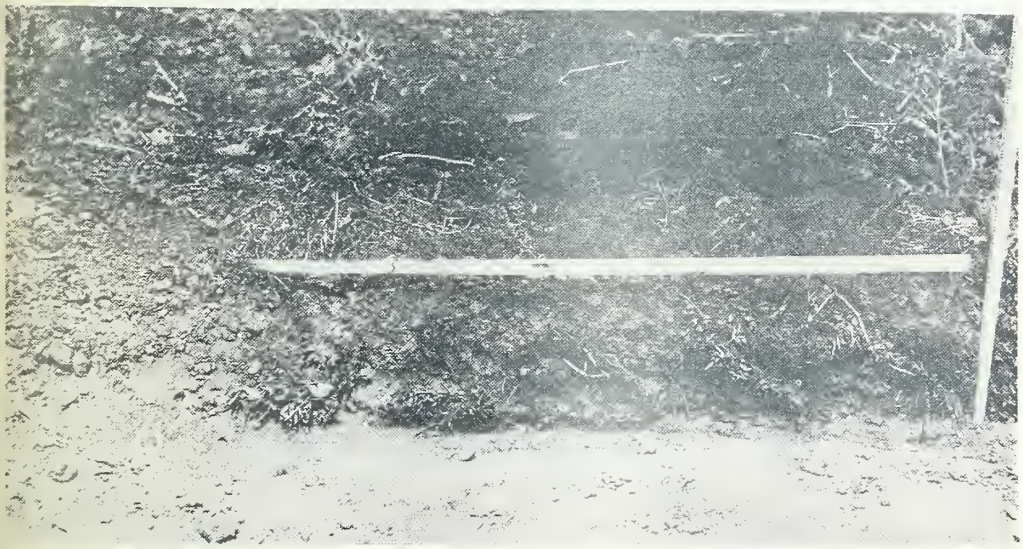


Fig. 7 Cross section of furrows turned with moldboard plows; all equipped with colters and wires.
a Tractor plow, 8 inches deep.
b Tractor plow, 4-1/2 inches deep.
c Walking plow, 4-1/2 inches deep.





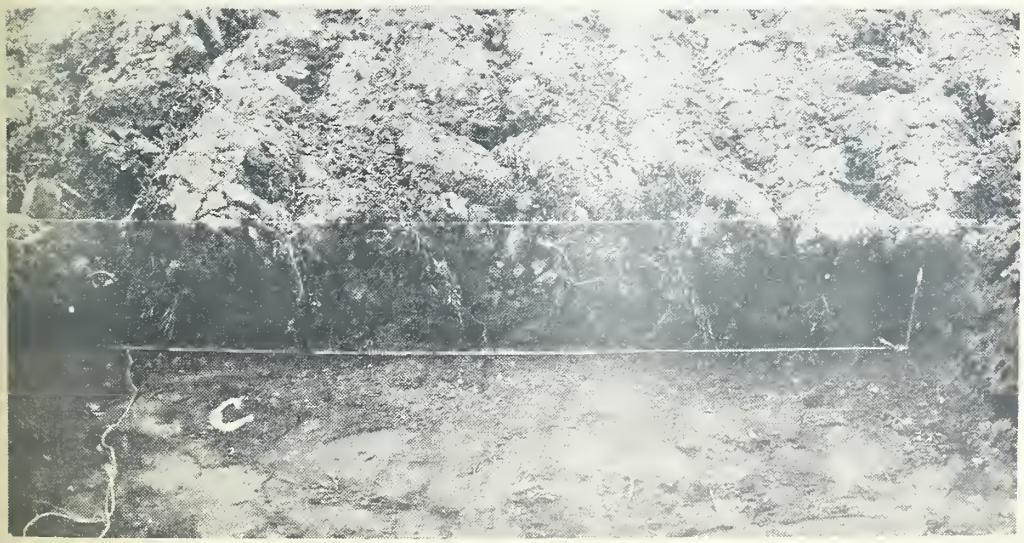


Fig. 8 Cross section of furrows turned with vertical disk plow.
a 3 inches deep, 4 miles per hour.
b 4-1/2 inches deep, 4 miles per hour.
c 4-1/2 inches deep, 2 miles per hour.

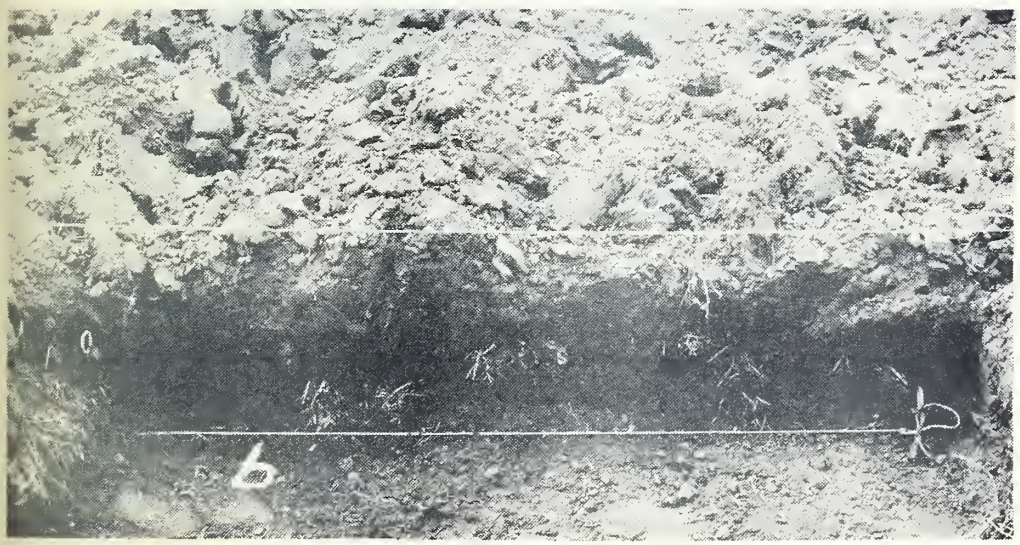


Fig. 9 Cross sections of furrows turned with standard disk plows.
a 4 to 5 inches deep, 4 miles per hour.
b 8 inches deep, 2 miles per hour.

Fig. 10 The clean plowing on the left was done with the moldboard plow shown in figure 5. The plowing on the right was done with a standard disk plow at 4 to 4-1/2 miles per hour. The depth of plowing was approximately the same.